Express Mail No.: EL 865330895 US Date: July 27, 2001

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ANNA C. RODE
(Name of person mailing paper or fee)

Anna C. Rode
(Signature)

09/890195

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		Attorney's Docket No: DIENER
INTERNATIONAL APPLICATION NO. PCT/EP00/00269	INTERNATIONAL FILING DATE JANUARY 14, 2000	PRIORITY DATE CLAIMED JANUARY 27, 1999

TITLE OF INVENTION
ELECTROMOTIVE DRIVE

APPLICANT(S) FOR DO/EO/US
KARL-FRIEDRICH DIENER, HERMANN-JOSEF CONRATHS, WERNER HOPF, WOLFGANG LIENERT, EKKEHARD PITTIUS, PETER SEITZ

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.

2. [ ] This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.

3. [X] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).

4. [ ] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US)

6. [X] A translation of the International Application into English (35 U.S.C. 371(c)(2)).

7. [ ] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [ ] have not been made and will not be made.

8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. [ ] Original or facsimile of an oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).

10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. concern other document(s) or information included:

11. [X] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.

12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included

13. [X] A **FIRST** preliminary amendment.
    [ ] A **SECOND** or **SUBSEQUENT** preliminary amendment.

14. [ ] A substitute specification.

15. [ ] A change of power of attorney and/or address letter.

16. [X] Other items or information: International Search Report, copies of cited prior art, Form PTO-1449

U.S.APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NO.
09/890195	PCT/EP00/00269	DIENER

17. [X] The following fees are submitted : BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):	
[X] For filing with EPO or JPO search report (37 C.F.R. 1.492(a)(5)) **$ 860.00**	**$ 860.00**
[ ] International preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(1)) **$ 690.00**	
[ ] No international preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(2)) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2)) **$ 710.00**	
[ ] Neither international preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(3)) nor international search fee paid to USPTO (37 C.F.R. 1.445(a)(2)) **$1,000.00**	
[ ] International preliminary examination fee paid to USPTO (37 C.F.R. 1.492(a)(4)) and all claims satisfied provisions of PCT Articles 33(2)-33(4) **$ 100.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	

Claims	Number Field	Rate	
Total Claims	23-20	x $ 18.00	**$ 54.00**
Independent Claims	1-3	x $ 80.00	
Multiple dependent claims (if applicable)		x $270.00	
		TOTAL OF ABOVE CALCULATIONS	**$ 914.00**
[ ] Applicant claims small entity status pursuant to 37 C.F.R. 1.27. Reduction by 1/2 for filing by small entity.			
		SUBTOTAL	**$ 914.00**
Processing fee of $130.00 for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date 37 CFR 1.492(f).			
		TOTAL NATIONAL FEE	**$ 914.00**
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). $40.00 per property +			**$ 0.00**
		TOTAL FEES ENCLOSED	**$ 914.00**
		Amount to be refunded	
		charged	

a. [X] A check in the amount of **$914.00** to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. **06-0502** in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **06-0502**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b) must be filed and granted to restore the application to pending status.

Send all correspondence to:

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Registration No. 31,084

09/[illegible]195

PATENT

[illegible] 27 JUL 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Docket No.: DIENER

In re Application of:	)
KARL-FRIEDRICH DIENER et al.	)
International Appl. No: PCT/EP00/00269	)
International Filing Date: January 14, 2000	)
For: ELECTROMOTIVE DRIVE	)

FIRST PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Express Mail mailing label number. **EL 865330895 US**
Date of Deposit: **July 27, 2001**
I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1 10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D C 20231

ANNA C. RODE
[Name of person mailing paper or fee]

Anna C. Rode
[Signature]

S I R:

Preliminary to the first Official Action in the above-entitled application, please amend the application as follows:

CLEAN VERSION OF REPLACEMENT PARAGRAPHS IN SPECIFICATION:

Replace paragraph **[0005]** as follows:

[0005] -- This object is achieved according to the invention by an electromotive drive, with at least one fan wheel which can be driven by an electric motor, wherein an electromagnetic slip coupling dependent on the motor speed is arranged between the motor shaft and the freely rotatably mounted fan wheel, wherein an electromagnetic speed limiting and governing device which limits the delivery of cooling air to the required quantity of cooling air is provided between the motor shaft and the fan wheel, wherein it is possible as from a predeterminable motor speed for the fan wheel speed to be reduced in relation to the motor speed in such a way that the driving-along effect of the slip coupling can be neutralized with increasing speed of the motor shaft until it is almost ineffective and increases again to the full driving-along effect as the motor speed drops, wherein the fan wheel is mounted freely rotatably on the motor casing by means of a mounting and wherein the motor shaft bears permanent magnets and the hub of the fan wheel has an electrically conductive part or the fan wheel is provided with permanent magnets and the motor shaft is provided with an electrically conductive part. This achieves the effect that the quantity of cooling air at relatively low motor speeds is available to an adequate extent, while the quantity of cooling air to be delivered at relatively high or high motor speeds no longer increases in

proportion to the increasing motor speed. The fact that, according to the invention, the fan wheel is mounted in the motor casing or on the bearing plate, and consequently not on the motor shaft, always results in an adequately high fan-wheel bearing speed, even when the relative speed of the motor shaft to the fan wheel is small or approaches zero. As a result, better running behavior and improved bearing lubrication of the fan wheel mounting are achieved. Whereas in the case of the known mounting of the fan wheel on the motor shaft the lubricant is forced by the then rotating bearing outer race and the centrifugal force toward the outer race and leads to increased bearing friction, the bearing outer race of the mounting of the fan wheel arranged in the motor housing or in the motor bearing plate is stationary, which reduces the bearing friction. The mechanical isolation of the fan wheel from the rotor of the electric motor has the effect of reducing for example bearing loads caused by a rotor imbalance.--.

Replace paragraph **[0010]** as follows:

[0010] --The invention also comprises a configuration, in which the electromagnetic slip coupling of which operates on the reluctance principle, whereby it is possible for the slip coupling parts also to be configured without the cage winding or copper sleeve.-.

CLEAN VERSION OF AMENDED CLAIMS:

3. (Amended) The electromotive drive as claimed in claim 1, characterized in that the mounting (4, 4') of the fan wheel (2) is seated with a bearing outer race in a bearing receptacle (8) of the motor casing (5) or motor bearing plate and an annular formation (9) on the fan wheel hub (7) is supported against the rotating bearing inner race of the fan wheel bearing (4, 4').

5. (Amended) The electromotive drive as claimed in claim 1, characterized in that the permanent magnets (6) and/or the sleeve (10) are arranged in an annular or segmentally annular manner on the hub (7) of the fan wheel (2) or on the motor shaft (3).

6. (Amended) The electromotive drive as claimed in claim 1, characterized in that the fan wheel (2) has a hub (7) of nonmagnetic material, such as aluminum, or in that the fan wheel consists of plastic and a sleeve (10) of electrically conductive material is fitted into the fan wheel hub.

7. (Amended) The electromotive drive as claimed in claim 1, characterized in that the parts of the electromagnetic slip coupling (6, 10) are arranged in coaxial or radial arrangement in relation to the motor shaft (3).

8. (Amended) The electromotive drive as claimed in claim 1, characterized in that the motor shaft bears permanent magnets and segments are cut out in the shaft of the fan wheel, or in that the fan wheel is provided with permanent magnets and the motor shaft has segmental cutouts over its circumference in such a way that, in the interaction of the segmented fan wheel hub with the permanent magnets of the motor shaft, or in the interaction of the segmented motor shaft with the permanent magnets of the fan wheel, and dependent on the motor speed, the speed limiting and governing device is effective.

9. (Amended) The electromotive drive as claimed in claim 1, characterized in that the center of the permanent magnets of one part of the slip coupling is axially offset in relation to the center of the other part of the slip coupling, forming a cage.

11. (Amended) The electromotive drive as claimed in claim 1, characterized in that one part of the slip coupling comprises one or more bar magnets fitted in bores of the motor shaft or in bores of the fan wheel.

12. (Amended) The electromotive drive as claimed in claim 1, characterized in that at least one fan wheel (2) for encapsulated or enclosed-ventilated electric motors (1) for rail vehicles and rail-bound vehicles for suction or pressure ventilation is freely mounted and formed on at least one motor bearing plate (5).

13. (Amended) The electromotive drive as claimed claim 1, characterized in that the parts of the electromagnetic slip coupling (6, 10) are dimensioned such that the maximum breakdown torque or the highest driving-along effect between the motor shaft (3) and the fan wheel (2) is reached at a predetermined motor speed, which is sufficient to overcome the drop in pressure of the aerodynamic circuit.

14. (Amended) The electromotive drive as claimed in claim 1, characterized in that it is intended for three-phase traction motors capable of being operated at high speeds.

VERSION WITH MARKINGS TO SHOW CHANGES MADE:

IN THE SPECIFICATION:

Before paragraph **[0001]**, delete "Description" and add the heading --BACKGROUND OF THE INVENTION--.

Before paragraph **[0004]**, add the heading --SUMMARY OF THE INVENTION--.

Amend paragraph **[0005]** as follows:

[0005] -- This object is achieved according to the invention by ~~the features of patent claim 1~~ an electromotive drive, with at least one fan wheel which can be driven by an electric motor, wherein an electromagnetic slip coupling dependent on the motor speed is arranged between the motor shaft and the freely rotatably mounted fan wheel, wherein an electromagnetic speed limiting and governing device which limits the delivery of cooling air to the required quantity of cooling air is provided between the motor shaft and the fan wheel, wherein it is possible as from a predeterminable motor speed for the fan wheel speed to be reduced in relation to the motor speed in such a way that the driving-along effect of the slip coupling can be neutralized with increasing speed of the motor shaft until it is almost ineffective and increases again to the full driving-along effect as the motor speed drops, wherein the fan wheel is mounted freely rotatably on the motor casing by means of a mounting and wherein the motor shaft bears permanent magnets and the hub of the fan wheel has an electrically conductive part or the fan wheel is

provided with permanent magnets and the motor shaft is provided with an electrically conductive part. This achieves the effect that the quantity of cooling air at relatively low motor speeds is available to an adequate extent, while the quantity of cooling air to be delivered at relatively high or high motor speeds no longer increases in proportion to the increasing motor speed. The fact that, according to the invention, the fan wheel is mounted in the motor casing or on the bearing plate, and consequently not on the motor shaft, always results in an adequately high fan-wheel bearing speed, even when the relative speed of the motor shaft to the fan wheel is small or approaches zero. As a result, better running behavior and improved bearing lubrication of the fan wheel mounting are achieved. Whereas in the case of the known mounting of the fan wheel on the motor shaft the lubricant is forced by the then rotating bearing outer race and the centrifugal force toward the outer race and leads to increased bearing friction, the bearing outer race of the mounting of the fan wheel arranged in the motor housing or in the motor bearing plate is stationary, which reduces the bearing friction. The mechanical isolation of the fan wheel from the rotor of the electric motor has the effect of reducing for example bearing loads caused by a rotor imbalance.--.

Amend paragraph **[0010]** as follows:

[0010] --The invention also comprises a configuration ~~as claimed in claim 8~~, in which the electromagnetic slip coupling of which operates on the reluctance principle, whereby it ~~being~~ is possible for the slip coupling parts also to be configured without the cage winding or copper sleeve.-.

Paragraph **[0012]** delete completely.

Before paragraph **[0013]**, add the heading --BRIEF DESCRIPTION OF THE DRAWING--.

Before paragraph **[0014]**, add the heading --DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS--.

Page 8, after the heading "CLAIMS" and before the first claim add --What is claimed is:--.

IN THE CLAIMS:

Amend the following claims:

3. (Amended) The electromotive drive as claimed in claim 1 ~~or 2~~, characterized in that the mounting (4, 4') of the fan wheel (2) is seated with a bearing outer race in a bearing receptacle (8) of the motor casing (5) or motor bearing plate and an annular formation (9) on the fan wheel hub (7) is supported against the rotating bearing inner race of the fan wheel bearing (4, 4').

5. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 4~~, characterized in that the permanent magnets (6) and/or the sleeve (10) are arranged in an annular or segmentally annular manner on the hub (7) of the fan wheel (2) or on the motor shaft (3).

6. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 5~~, characterized in that the fan wheel (2) has a hub (7) of nonmagnetic material, such as aluminum, or in that the fan wheel consists of plastic and a sleeve (10) of electrically conductive material is fitted into the fan wheel hub.

7. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 6~~, characterized in that the parts of the electromagnetic slip coupling (6, 10) are arranged in coaxial or radial arrangement in relation to the motor shaft (3).

8. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 7~~, characterized in that the motor shaft bears permanent magnets and segments are cut out in the shaft of the fan wheel, or in that the fan wheel is provided with permanent magnets and the motor shaft has segmental cutouts over its circumference in such a way that, in the interaction of the segmented fan wheel hub with the permanent magnets of the motor shaft, or in the interaction of the segmented motor shaft with the permanent magnets of the fan wheel, and dependent on the motor speed, the speed limiting and governing device is effective.

9. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 7~~, characterized in that the center of the permanent magnets of one part of the slip coupling is axially offset in relation to the center of the other part of the slip coupling, forming a cage.

11. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 10~~, characterized in that one part of the slip coupling comprises one or more bar magnets fitted in bores of the motor shaft or in bores of the fan wheel.

12. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 11~~, characterized in that at least one fan wheel (2) for encapsulated or enclosed-ventilated electric motors (1) for rail vehicles and rail-bound vehicles for suction or pressure ventilation is freely mounted and formed on at least one motor bearing plate (5).

13. (Amended) The electromotive drive as claimed in ~~one of claims~~ claim 1 ~~to 12~~, characterized in that the parts of the electromagnetic slip coupling (6, 10) are dimensioned such that the maximum breakdown torque or the highest driving-along effect between the motor shaft (3) and the fan wheel (2) is reached at a predetermined motor speed, which is sufficient to overcome the drop in pressure of the aerodynamic circuit.

14. (Amended) The electromotive drive as claimed in ~~one or more of claims~~ claim 1 ~~to 13~~, characterized in that it is intended for three-phase traction motors capable of being operated at high speeds.

Add the following claims:

15. (New) The electromotive drive as claimed in claim 4, characterized in that the permanent magnets (6) and/or the sleeve (10) are arranged in an annular or segmentally annular manner on the hub (7) of the fan wheel (2) or on the motor shaft (3).

16. (New) The electromotive drive as claimed in claim 5, characterized in that the fan wheel (2) has a hub (7) of nonmagnetic material, such as aluminum, or in that the fan wheel consists of plastic and a sleeve (10) of electrically conductive material is fitted into the fan wheel hub.

17. (New) The electromotive drive as claimed in claim 5, characterized in that one part of the slip coupling comprises one or more bar magnets fitted in bores of the motor shaft or in bores of the fan wheel.

18. (New) The electromotive drive as claimed in claim 4, characterized in that one part of the slip coupling comprises one or more bar magnets fitted in bores of the motor shaft or in bores of the fan wheel.

19. (New) The electromotive drive as claimed in claim 3, characterized in that the parts of the electromagnetic slip coupling (6, 10) are dimensioned such that the maximum breakdown torque or the highest driving-along effect between the motor shaft (3) and the fan wheel (2) is reached at a predetermined motor speed, which is sufficient to overcome the drop in pressure of the aerodynamic circuit.

20. (New) The electromotive drive as claimed in claim 4, characterized in that the parts of the electromagnetic slip coupling (6, 10) are dimensioned such that the maximum breakdown torque or the highest driving-along effect between the motor shaft (3) and the fan wheel (2) is reached at a predetermined motor speed, which is sufficient to overcome the drop in pressure of the aerodynamic circuit.

21. (New) The electromotive drive as claimed in claim 3, characterized in that it is intended for three-phase traction motors capable of being operated at high speeds.

22. (New) The electromotive drive as claimed in claim 11, characterized in that it is intended for three-phase traction motors capable of being operated at high speeds.

23. (New) The electromotive drive as claimed in claim 12, characterized in that it is intended for three-phase traction motors capable of being operated at high speeds.

REMARKS

This Amendment is submitted preliminary to the issuance of an Office Action in the present application.

Applicant has amended claims 3, 5-9, 11-14 to remove any multiple dependency of the claims. In addition, applicant submits herewith new claims 15 to 23 which set forth subject matter of original claims 5, 6, 11, 13, 14, respectively. The specification has been amended to present it with proper headings and to delete any reference to particular claim numbers.

When the Examiner takes this application up for action, it is requested to take the foregoing into account.

The Commissioner is hereby authorized to charge fees which may be required, or credit any overpayment to Deposit Account No. 06-0502.

Respectfully submitted,

By: _____
Henry M. Feiereisen
Agent for Applicant
Reg. No. 31,084

Date: July 27, 2001
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09/890195
JC18 Rec'd PCT/PTC 27 JUL 2001

Description

ELECTROMOTIVE DRIVE

[0001] The invention relates to an electromotive drive, with at least one fan wheel which can be driven by an electric motor, an electromagnetic slip coupling, dependent on the motor speed, being arranged between the motor shaft and the freely rotatably mounted fan wheel.

[0002] Electric motors for rail and rail-bound vehicles, such as three-phase traction motors, are increasingly being operated at high speeds, in order to keep down the motor torques and consequently the motor weight and also the size. According to EP 0 826 266 B1, a fan wheel mounted freely rotatably on the motor shaft is provided for motor cooling, an electromagnetic speed limiting and governing device which limits the delivery of cooling air to the required quantity of cooling air being formed between the motor shaft and the fan wheel, and it being possible as from a predeterminable motor speed for the fan wheel speed to be reduced in relation to the motor speed in such a way that the driving-along effect of the slip coupling can be neutralized with increasing speed of the motor shaft until it is almost ineffective and increases again to the full driving-along effect as the motor speed drops.

[0003] In the earlier German patent application 198 01 310.8, an

electromotive drive of this type is described, the slip coupling being designed in such a way that the motor shaft bears permanent magnets and segments are cut out in the hub of the fan wheel, or that the fan wheel is provided with permanent magnets and the motor shaft has segmental cutouts over its circumference in such a way that, in the interaction of the segmented fan wheel hub with the permanent magnets of the motor shaft, or in the interaction of the segmented motor shaft with the permanent magnets of the fan wheel, and dependent on the motor speed, the speed limiting and governing device is effective. This slip coupling operates on the reluctance principle.

[0004] The object of the invention is to improve further an electromagnetic drive of the type described with respect to its self-ventilation or motor cooling by at least one fan wheel which can be driven by the motor.

[0005] This object is achieved according to the invention by the features of patent claim 1. This achieves the effect that the quantity of cooling air at relatively low motor speeds is available to an adequate extent, while the quantity of cooling air to be delivered at relatively high or high motor speeds no longer increases in proportion to the increasing motor speed. The fact that, according to the invention, the fan wheel is mounted in the motor casing or on the bearing plate, and consequently not on the motor shaft, always results in an adequately high fan-wheel bearing speed, even when the relative speed of the motor shaft to the fan wheel is small or approaches zero. As a result, better running behavior

and improved bearing lubrication of the fan wheel mounting are achieved. Whereas in the case of the known mounting of the fan wheel on the motor shaft the lubricant is forced by the then rotating bearing outer race and the centrifugal force toward the outer race and leads to increased bearing friction, the bearing outer race of the mounting of the fan wheel arranged in the motor housing or in the motor bearing plate is stationary, which reduces the bearing friction. The mechanical isolation of the fan wheel from the rotor of the electric motor has the effect of reducing for example bearing loads caused by a rotor imbalance.

[0006] According to one configuration of the invention, it is provided that the electrically conducting part of the fan wheel or of the motor shaft forming the electromagnetic slip coupling with the permanent magnets of the motor shaft or of the fan wheel comprises a sleeve of electrically conductive material. This has the effect that the electrically conductive sleeve, which is to be of a simple design and is seated in the magnetically permeable fan wheel hub, dispenses with the need for an additional cage winding. The simple to produce sleeve preferably consists of copper.

[0007] According to a further configuration, the fan wheel or the fan wheel hub may consist of nonmagnetic material, for example aluminum, dispensing with an additional sleeve. On the other hand, the fan wheel may be made of plastic, with an electrically conductive sleeve, for example a copper sleeve, fitted into the plastic hub. In the case of these configurations, a weight reduction is possible,

which is important for drives operating at high speeds.

[0008] A further configuration is distinguished according to the invention by the fact that, for a drive with a small overall axial length, the parts of the electromagnetic slip coupling (magnets and cage) are not arranged coaxially, but radially (disk rotor principle) in relation to the motor shaft.

[0009] According to the invention, the electromagnetic slip coupling may be designed such that the center of the magnets and of the cage are axially offset, producing an axial force component which acts on the fan wheel mounting and prevents a tumbling movement. In this case a fan wheel mounting can only be configured with one bearing, for example a double-row bearing or a mounting unit, between the motor casing or the motor bearing plate and the fan wheel.

[0010] The invention also comprises a configuration as claimed in claim 8, the electromagnetic slip coupling of which operates on the reluctance principle, it being possible for the slip coupling parts also to be configured without the cage winding or copper sleeve.

[0011] In the design of the electromagnetic part of the slip coupling, pairs of permanent magnets may also be replaced by one or more bar magnets, which are able to be fitted for example into transverse bores of the motor shaft or in bores of the fan wheel. In this case, resultant centrifugal forces on the magnets

can be avoided and simple fastening and fixing of the bar magnets is possible.

[0012] Advantageous configurations of the invention are specified in the further patent claims.

[0013] The invention is explained below on the basis of an exemplary embodiment with reference to the drawing, which shows a partial section through an electromotive drive according to the invention, as is suitable in particular for three-phase traction motors capable of being operated at high speeds.

[0014] Of an electric motor 1 known per se, a motor bearing plate and a motor casing cover 15 of the motor casing 5 are shown, as well as a motor shaft 3, a motor shaft bearing 13, a motor shaft bearing cover 14 and also a fan wheel 2 with a fan wheel blade 16. According to the exemplary embodiment depicted, the fan wheel 2 is mounted freely rotatably by means of its fan wheel hub 7 in coaxial arrangement in relation to the motor shaft 3 in the motor casing 5 or in the motor bearing plate. The mounting of the fan wheel 2, comprising two bearings 4, 4' in the configuration represented, is seated with its stationary bearing outer race in a bearing receptacle 8 of the motor casing 5 or of the motor bearing plate, with an annular formation 9 on the fan wheel hub 7 being supported against the rotating bearing inner race of the fan wheel bearing 4, 4'. As represented, the mounting of the fan wheel may comprise, for example, two bearings 4, 4' or a double-row bearing or else a mounting unit with the bearing

rows 4, 4'. The mounting is also assigned an axial fixing means known per se (not represented).

[0015] Between the freely rotatably mounted fan wheel 2 and the motor shaft 3 there is an electromagnetic speed limiting and governing device for the cooling air blower. The device designed as an electromagnetic slip coupling acts in such a way that, with increasing motor speed, in particular as from a specific speed range, the drive effect on the fan wheel via the slip coupling decreases. On the other hand, with a motor speed dropping below a specific speed range, the slip coupling causes the drive effect of the coupling on the fan wheel to increase again. The parts 6, 10 of the electromagnetic slip coupling separated by a predeterminable air gap 11 are formed by magnets 6 or a cage 10.

[0016] In the exemplary embodiment depicted, the motor shaft 3 bears permanent magnets 6, whereas the fan wheel 2 or the fan wheel hub 7 is fitted with one or more squirrel-cage or cage windings 10. The cage 10 is made from a copper sleeve, which can be fitted into the hub 7 of, for example, a plastic fan wheel 2. An air gap between the bearing formation 9 on the fan wheel hub and the motor shaft 3 is denoted by 12.

[0017] According to an exemplary embodiment not represented, the permanent magnets may also be arranged on the fan wheel and the electrical part 10 of the cage may be arranged on the motor shaft. The magnetic excitation

of the slip coupling takes place via the permanent magnets and on the basis of the rotation of the motor shaft 3 or of the fan wheel 2. The torque required for driving along the fan wheel is produced by induction of an electric voltage in the cage 10 in the same manner in principle as in the case of an asynchronous machine with a cage rotor. The arrangement is dimensioned in particular such that - disregarding possible reaction torques - the maximum torque (breakdown torque) is reached at a predetermined speed, at which it is sufficient to overcome the drop in pressure of the aerodynamic circuit. This speed will generally lie between 50 and 75% of the highest motor speed. If the motor speed increases above this value, a lower speed is established on the basis of the torque-slip characteristic of the coupling for the fan wheel, whereby the quantity of cooling air, energy consumption and noise of the fan are reduced.

CLAIMS

1. An electromotive drive, with at least one fan wheel (2) which can be driven by an electric motor (1),

- wherein an electromagnetic slip coupling dependent on the motor speed is arranged between the motor shaft (3) and the freely rotatably mounted fan wheel,
- wherein an electromagnetic speed limiting and governing device which limits the delivery of cooling air to the required quantity of cooling air is provided between the motor shaft (3) and the fan wheel (2),
- wherein it is possible as from a predeterminable motor speed for the fan wheel speed to be reduced in relation to the motor speed in such a way that the driving-along effect of the slip coupling can be neutralized with increasing speed of the motor shaft until it is almost ineffective and increases again to the full driving-along effect as the motor speed drops,
- wherein the fan wheel (2) is mounted freely rotatably on the motor casing (5) by means of a mounting (4, 4') and
- wherein the motor shaft (3) bears permanent magnets (6) and the hub (7) of the fan wheel (2) has an electrically conductive part or the fan wheel is provided with permanent magnets and the motor shaft is provided with an electrically conductive part.

2. The electromotive drive as claimed in claim 1, characterized in that the fan wheel (2) is mounted in a motor bearing plate of the motor casing (5).

3. The electromotive drive as claimed in claim 1 or 2, characterized in that the mounting (4, 4') of the fan wheel (2) is seated with a bearing outer race in a bearing receptacle (8) of the motor casing (5) or motor bearing plate and an annular formation (9) on the fan wheel hub (7) is supported against the rotating bearing inner race of the fan wheel bearing (4, 4').

4. The electromotive drive as claimed in claim 1, characterized in that the electrically conducting part of the fan wheel or of the motor shaft forming the electromagnetic slip coupling with the permanent magnets (6) of the motor shaft (3) or of the fan wheel (2) comprises a sleeve (10) of electrically conductive material, such as a copper sleeve.

5. The electromotive drive as claimed in one of claims 1 to 4, characterized in that the permanent magnets (6) and/or the sleeve (10) are arranged in an annular or segmentally annular manner on the hub (7) of the fan wheel (2) or on the motor shaft (3).

6. The electromotive drive as claimed in one of claims 1 to 5, characterized in that the fan wheel (2) has a hub (7) of nonmagnetic material, such as aluminum, or in that the fan wheel consists of plastic and a sleeve (10) of electrically conductive material is fitted into the fan wheel hub.

7. The electromotive drive as claimed in one of claims 1 to 6, characterized in that the parts of the electromagnetic slip coupling (6, 10) are arranged in coaxial or radial arrangement in relation to the motor shaft (3).

8. The electromotive drive as claimed in one of claims 1 to 7, characterized in that the motor shaft bears permanent magnets and segments are cut out in the shaft of the fan wheel, or in that the fan wheel is provided with permanent magnets and the motor shaft has segmental cutouts over its circumference in such a way that, in the interaction of the segmented fan wheel hub with the permanent magnets of the motor shaft, or in the interaction of the segmented motor shaft with the permanent magnets of the fan wheel, and dependent on the motor speed, the speed limiting and governing device is effective.

9. The electromotive drive as claimed in one of claims 1 to 7, characterized in that the center of the permanent magnets of one part of the slip coupling is axially offset in relation to the center of the other part of the slip coupling, forming a cage.

10. The electromotive drive as claimed in claim 9, characterized in that the mounting of the fan wheel in the motor casing or in the motor bearing plate comprises a single bearing.

11. The electromotive drive as claimed in one of claims 1 to 10, characterized in that one part of the slip coupling comprises one or more bar magnets fitted in bores of the motor shaft or in bores of the fan wheel.

12. The electromotive drive as claimed in one of claims 1 to 11, characterized in that at least one fan wheel (2) for encapsulated or enclosed-ventilated electric motors (1) for rail vehicles and rail-bound vehicles for suction or pressure ventilation is freely mounted and formed on at least one motor bearing plate (5).

13. The electromotive drive as claimed in one of claims 1 to 12, characterized in that the parts of the electromagnetic slip coupling (6, 10) are dimensioned such that the maximum breakdown torque or the highest driving-along effect between the motor shaft (3) and the fan wheel (2) is reached at a predetermined motor speed, which is sufficient to overcome the drop in pressure of the aerodynamic circuit.

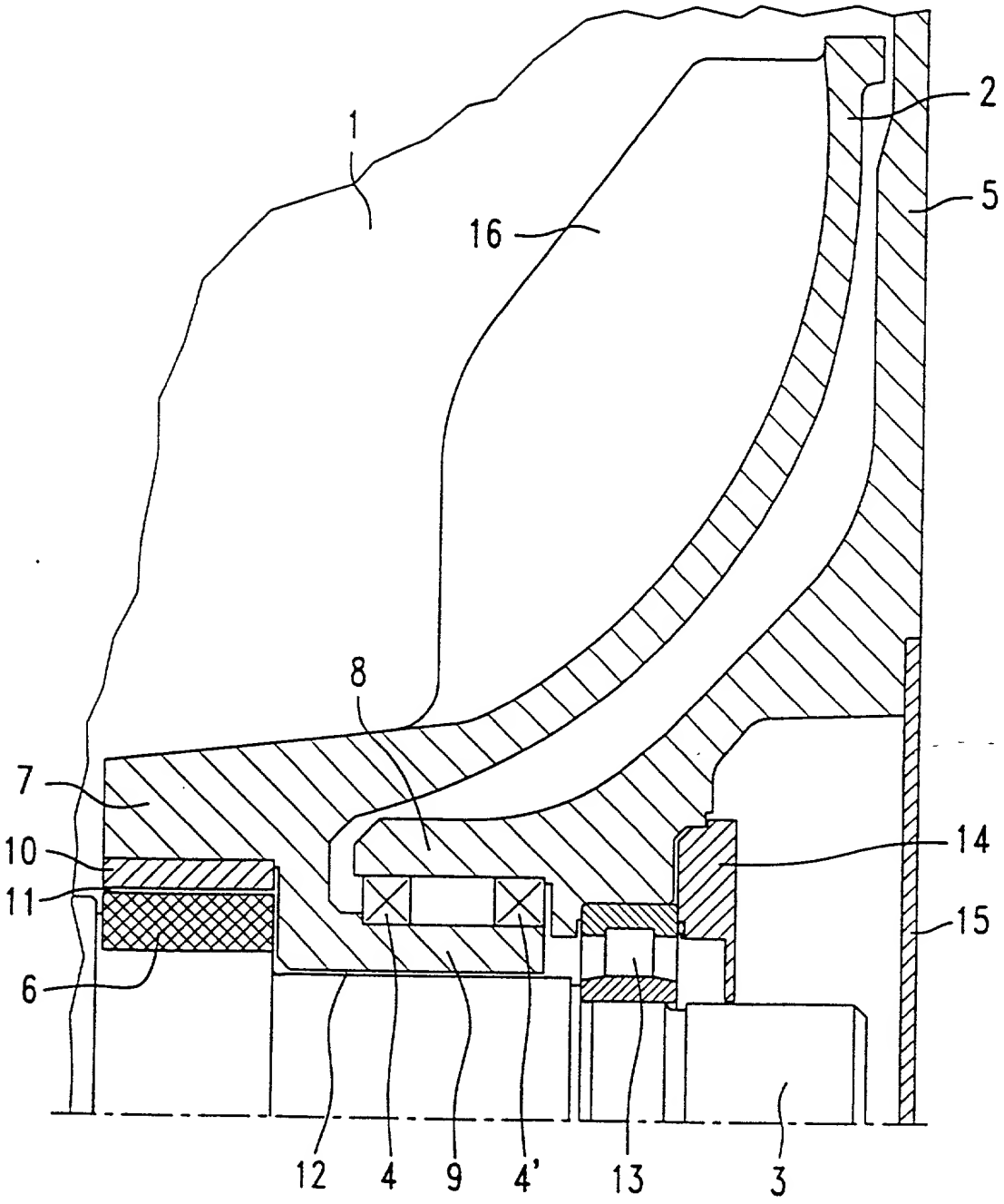
14. The electromotive drive as claimed in one or more of claims 1 to 13, characterized in that it is intended for three-phase traction motors capable of being operated at high speeds.

ABSTRACT

ELECTROMOTIVE DRIVE

The aim is to improve the cooling of a self-ventilated electric motor (1). To this end, an electromagnetic speed limiting and governing device is provided between the motor shaft (3) and the fan wheel (2), the fan wheel, which is driven via an electromagnetic slip coupling (6, 10) in accordance with the motor speed, being mounted freely rotatably on the motor casing or on the motor bearing plate (5).

Figure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Ich bestätige hiermit, daß ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell duch einen Zusatzantrag, wie oben erwähnt, abgeändert wurde.

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As a below named inventor, I hereby declare that:

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the specification of which
(check one)

[ ] is attached hereto
[X] was filed on 14 January 2000 as United States Application Number or PCT International Application Number PCT/EP00/00269, and was amended on _____ (if applicable).

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Prior Foreign Applications (Frühere ausländische Anmeldungen)			Priority Claimed? Priorität beansprucht?	
99 101 472.1 (Number) (Nummer)	Europe (Country) (Land)	27/January/1999 (Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	[X] Yes Ja	[ ] No Nein
(Number) (Nummer)	(Country) (Land)	(Day/Month/Year Filed) (Tag/Monat/Jahr eingereicht)	[ ] Yes Ja	[ ] No Nein

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(Application No. / Anmeldenr.) (Filing Date / Anmeldedatum)

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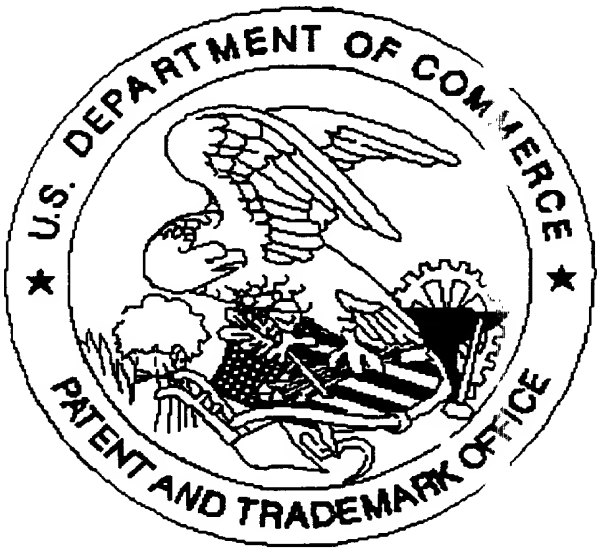

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